

DISCUSSION OF THE CLAIMS

Claims 1, 4-12, 14-18 and 20-23 are active in the present application. Claims 20-23 are new claims. Claims 2-3, 13 and 19 are cancelled claims. Support for the new claims is found in the examples (see pages 43-44). Support for new Claim 20 is found on page 23, lines 3-8. Support for new Claim 21 is found on page 11, lines 2-3 and 13-18.

No new matter is believed to have been added by this amendment.

REMARKS

The Examiner newly cites descriptions in Kawada (U.S. 5,158,619) of “superior environmental stability” (column 3, line 30) and “heat resistance and solvent resistance” (column 5, line 65). However, such disclosure shows comparison between the photoconductive polyimide of Kawada and conventional organic photoelectron-transducing materials. This disclosure is not definitive evidence that a carbazole structure will improve the environmental stability, heat resistance, solvent resistance, etc. of a polyimide. This is apparent from “Related Background Art” of Kawada (column 1) where Kawada discloses that such improvements are a result of a comprehensive investigation to introduce a photoconductive organic moiety into a polymer to achieve satisfactory heat resistance and environmental stability (column 3, line 20) and/or Kawada’s disclosure that polyimides are generally known to have excellent heat resistance, wear resistance and chemical resistance (column 2, line 16).

The Examiner now also asserts there is motivation to combine a polyimide having a carbazole structure with Sawahata (US 6,294,639) by pointing out that Kawada’s polyimide possesses workability of forming into a desired shape, easiness of production and inexpensiveness. However, these properties are described in terms relative to conventional organic photoelectro-transducing materials. That is, such properties are generally possessed by a polyamide and by no means exclusively a function of the introduction of a carbazole structure. Furthermore, the Examiner says that good peeling resistance between the polymer and a substrate is expected due to hydrogen bond of NH group in a carbazole ring. However, Kawada has no such explicit disclosure and the Office provides no evidentiary basis for this statement.

Therefore, the alleged motivation to combine Kawada with Sawahata suffers from severe factual deficiencies which undercut any motivation to combine the cited references.

The response submitted in the present case on October 29, 2008, included arguments providing reasons why the combination of Sawahata and Kawada does not render the presently claimed invention obvious.

In particular, the arguments included an explanation that Sawahata's disclosure of compositions containing a polyamic acid and a polyimide shows that the inclusion of two different materials (e.g., which the Office asserts corresponds to the polyamic acid and/or polyimide and/or polyimide precursor of the present claims) provides electronic properties that are less desirable than the electronic properties of compositions which have only one of a polyamic acid, polyimide or polyimide precursor (see page 5 of the October 29, 2008 Response). This argument is reproduced below for convenience.

The Office asserts that Sawahata discloses compositions that include two different polyamic acid and/or polyimide-type materials corresponding with the polyimide precursor (1) and the polyimide precursor (2-1) of present Claim 1. The Office cites Example 10 of Sawahata in support of the rejection. The Office appears to take the position that it would be obvious to include a mixture of different polyimide precursors in a liquid crystal aligning agent because Sawahata does so in Example 10. Applicants point out, however, that Example 10 of Sawahata has poor electronic properties in comparison to the examples of Sawahata that are made from only a single type of polyimide precursor.

Example 10 describes a mixture of a first composition containing a polyamic acid (A-1) and polyimide (S-1). The polyimide used in the polyamic acid/polyimide mixture of Example 10 is described in Example 7 of Sawahata. Comparison of the electronic properties of the single-component Sawahata compositions with the two-component Sawahata compositions should tell those of ordinary skill in the art whether using a mixture of different polyimide precursors has advantages. A close look at Example 10 shows that using a mixture

of polyimide precursors provides a product having poor electronic properties in comparison to the composition containing only a single polyimide-type material.

The polyimide (S-1) of Example 10 of Sawahata is described in Example 7 of Sawahata. Example 7 also provides the electronic properties of an article made from a polymer containing the polyimide precursor material S-1 of Example 7. The voltage holding property of the device described in Example 7 (i.e., made from only a single type of polyimide precursor (e.g., the polyimide (S-1))) is shown to have voltage holding property of 99% and 83% at 23°C and 90°C respectively.

Example 10 which includes the material S-1 of Example 7 of Sawahata in combination with a further polyimide precursor is shown to have a lower voltage holding capability (i.e., 99% and 81% at 23°C and 90°C, respectively).

It is thus clear in the record that the cited art discloses that using two different polyimide precursors (i.e., in a manner similar to that presently claimed), will provide a material having electronic properties that are less desirable than materials derived from using only a single polyimide precursor.

Applicants submit that the evidence of record and arguments above are probative of the patentability of the presently claimed invention. In particular, the evidence of record as explained above, shows that those of ordinary skill in the art reading the Sawahata and Kawada publications would draw the conclusion that including two different polyimide precursors in a liquid crystal aligning agent material would result in a material having lower voltage holding characteristics. Applicants submit that such disclosure communicates to those of ordinary skill in the art that poor performance is associated with the use of mixtures of polyimide precursor materials for making liquid crystal alignment films.

The Office Action of April 28, 2009 fails to address this argument. Applicants submit that the argument should be given full consideration and the rejection should be withdrawn at

least for the reason that those of ordinary skill in the art would have no reason to believe that superior electronic properties may be obtained by combining two different polyimide precursors in a liquid crystal aligning agent.

Further, contrary to the evidence of record, Applicants have shown that the liquid crystal aligning agent of the presently claimed invention provides significantly superior performance properties through a combination of two different polyimide precursors. The liquid crystal aligning agent of the present claims includes a specific polymer "a" and a specific polymer "b". The polymer "a" is a polyimide precursor having a structural unit of formula (1), and from 10 to 100 mol% of "A" in formula (1) is a bivalent organic group having the structure (7) as a carbazole group. The polymer "b" is a polyimide precursor having a structural unit of formula (2-1) or a polyimide having a structural unit of formula (2-2), and from 10 to 100 mol% of "B" in formula (2-1) and (2-2) is a bivalent organic group having any one of the structures (3) to (5) in its structure, or a paraphenylene group.

Applicants draw the Office's attention to Comparative Example 1 of the specification which discloses a liquid crystal aligning agent made from the polyamic acid solution (PA-a1) and (PA-1). The polyamic acid solutions PA-1 is described in Preparation Example 27 on page 49 and includes the monomer components TC-1 and DA-3. The polyamic acid solution (PA-a1) is made from the monomers TC-1 and DA-1 (see preparation Example 1).

Comparative Example 1 is not encompassed by the present claims at least for the reason that it does not contain the polymer "b".

Comparative Example 1 has alignment controlling power described as follows:

A clear contrast was observed between the pixel to which a voltage was applied and the pixel to which no voltage was applied, and the liquid crystal at the pixel to which a voltage was applied was confirmed not to recover to the original alignment state.

See the paragraph bridging pages 58 and 59 of the specification.

Likewise, the liquid crystal alignment properties of Comparative Example 1 are inferior:

Flow alignment was formed in the form of a fan along the liquid crystal injection direction, and the liquid crystal was not uniformly aligned.

See page 58, lines 19-22 of the specification.

Such results may be compared with the inventive liquid crystal aligning agents described in Table 1 on page 57 of the specification. In contrast to the above-discussed comparative example, the inventive examples all provide good alignment properties and good controlling power. The liquid crystal aligning agent of Comparative Example 1 is inferior to inventive examples such as Examples 11 and 12 which both contain a polyimide precursor as the polymer "a" (i.e., (PA-a6)) and a polyimide precursor as the polymer "b" (i.e., (PA-b3) or (PA-b4)) in a ratio of 80:20 (see page 56 of the specification).

Further, Applicants draw the Office's attention to Comparative Example 2 of the specification which discloses a liquid crystal aligning agent made from the polyamic acid solution (PA-1) and (PA-b4). The polyamic solution (PA-b4) is made from monomers TC-1 and DA-6 (see Preparation Example 16). Comparative Example 2 is not encompassed by the present claims at least for the reason that it does not contain polymer "a".

Comparative Example 2 has electronic properties described as follows:

Voltage retention characteristics: The voltage retention = 98.9% at 23°C and 88.2 at 90°C.

See page 59, lines 16-17 of the specification.

Such results may be compared with the inventive liquid crystal aligning agent as Example 12 which contains the (PA-a6) polyimide precursor and the (PA-b4) polyimide precursor. Example 12 is shown to have voltage retention of 98.9% and 89.1% at 23°C and 90°C, respectively (see Table 1 on page 57).

The liquid crystal aligning agent of Comparative Example 2 is inferior to inventive examples such as Example 12 which contains the (PA-a6) polyimide precursor. The polyamic acid solution PA-a6 is described on page 46 and includes the monomer components TC-1 and DA-2. The monomer component DA-2 contains a carbazole group.

Further, Example 12 of the specification is shown to have higher voltage retention characteristics (voltage holding capability) than that of Example 10 of Sawahata.

Applicants submit that there is nothing in the art cited by the Office that would disclose or suggest that improved alignment properties and/or alignment controlling power may be derived from the liquid crystal aligning agent of the presently claimed invention. Applicants thus submit that the data of the original specification rebut the Office's assertion of obviousness.

Applicants draw the Office's attention to new dependent Claim 20 which recites a group Y of the formula (2-1) and (2-2) that is an organic group. Applicants submit that the subject matter of new dependent Claim 20 is further patentable over the art relied on by the Office at least for the reason that the Sawahata patent describes a polyimide or a polyimide precursor that must contain a group R¹ corresponding with the group Y of formula (2-1) and (2-2) of the present claims that must be "an alicyclic structure having from 2 to 5 rings condensed." The importance of a R¹ group in the polyimide precursor of Sawahata is emphasized throughout the patent. For example:

It is essential that the alignment treating agent of the present invention contains a polyamic acid containing repeating units using a tetracarboxylic acid component which has an alicyclic structure having from 2 to 5 rings condensed ...

See column 7, lines 17-20 of Sawahata.

Applicants submit that those of ordinary skill in the art have no motivation to make the liquid crystal aligning agent of new dependent Claim 20 based on Sawahata, alone or in

combination with Kawada, for the reason that Sawahata explicitly requires the inclusion of, and emphasizes the importance of, including an alicyclic group instead of an aromatic group.

Applicants further draw the Office's attention to new dependent Claim 22 which recites a polyimide precursor having a group X which must be a cyclobutane group. Applicants submit that such a polyimide precursor is not disclosed or suggested by the art relied on by the Office. For example, a cyclobutane group is not an alicyclic structure having 2 to 5 rings condensed such as that described in Sawahata. Likewise, a cyclobutane group is not encompassed by the carboxylic-type Kawada for the reason that the Kawada polyimide precursor must include a group R¹ corresponding with the group X of formula (1) of the present claims wherein R¹ has "5 to 13 carbons". Because cyclobutane has only 4 carbons, the subject matter of new dependent Claim 22 is not encompassed by the description of Kawada.

35 U.S.C. §112

The Office appears to take the position that Claims 1, 6 and 10 are unclear with respect to the amounts of components A and B which may be present in the claims invention. The Office appears to interpret the claim in a manner that is contradictory to the explicit language of the claims.

Claim 1 describes an aligning agent that includes (I) a polyimide precursor that has a structural unit of formula (1), and (II) a polyimide precursor having a structural unit represented by formula (2-1) or (III) a polyimide having a structural unit represented by the formula (2-2). The structural unit of formula (1) includes the group A which may be present in an amount of 10-100 mol% in the structural unit of formula (1). Structural units of formulas (2-1) and (2-2) include the group B which may be present in an amount of 10-100 mol% in the structural units of formulas (2-1) and (2-2).

The amount of A in mol % present in the structural unit of formula (1) is independent of the amount of B in mol % present in structural units (2-1) and (2-2).

Applicants thus submit that the Office's assertion that the amount of A may limit the amount of B is not correct. Applicants respectfully request withdrawal of the rejection.


For the reasons discussed above in detail, Applicants submit that all now-pending claims are in condition for allowance. Applicants request withdrawal of the rejection and the allowance of all now-pending claims.

Respectfully submitted,

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